

What is Claimed is:

1. A semiconductor circuit comprising a circuit including at least a semiconductor device and an inductance connected to said circuit wherein a flowing current is controlled to flowing and cut-off states,

wherein, for values of a blocking-direction voltage applied to terminals of said circuit including said semiconductor device equal to or greater than a first voltage value but equal to or smaller than a second voltage value, the magnitude of a current increases with an increase in said blocking-direction voltage and, for values of said blocking-direction voltage equal to or greater than said second voltage value, said current rises at a rate of increase greater than a rate of increase for values of said blocking-direction voltage equal to or greater than said first voltage value but equal to or smaller than said second voltage value.

2. A semiconductor circuit according to Claim 1 wherein said semiconductor device comprises a semiconductor switching device.

3. A semiconductor circuit according to Claim 1 wherein said semiconductor device comprises a diode.

4. A semiconductor circuit according to Claim 1 wherein said circuit including said semiconductor device comprises a snubber circuit.

5. A semiconductor circuit including at least a semiconductor device,

wherein, for values of a blocking-direction voltage applied to terminals of said semiconductor circuit equal to or greater than a first voltage value but equal to or smaller than a second voltage value, the magnitude of a current increases with an increase in said blocking direction voltage and, for values of said blocking-direction voltage equal to or greater than said second voltage value, said current rises at a rate of increase greater than a rate of increase for values of said blocking-direction voltage equal to or greater than said first voltage value but equal to or smaller than said second voltage value.

6. A semiconductor circuit according to Claim 5 wherein said semiconductor device comprises a semiconductor switching device.

7. A semiconductor circuit according to Claim 5 wherein said semiconductor device comprises a diode.

8. A semiconductor circuit according to Claim 5 wherein said semiconductor device comprises a plurality of diodes having breakdown voltages different from each other.

9. A semiconductor circuit comprising a circuit including at least a semiconductor device and a semiconductor switching device interposed in parallel between terminals of said circuit wherein, for values of a blocking-direction voltage applied to said terminals of said circuit equal to or greater than a first voltage value but equal to or smaller than a second voltage value, the magnitude of a current increases with an increase in said blocking-direction voltage and, for values of said blocking-direction voltage equal to or greater than said second voltage value, said current rises at a rate of increase greater than a rate of increase for values of said blocking-direction voltage equal to or greater than said first voltage value but equal to or smaller than said second voltage value.

10. A method of driving a semiconductor circuit including a semiconductor switching device comprising supplying a control signal to said semiconductor switching device in

accordance with a blocking-direction voltage applied to main terminals of said semiconductor switching device in such a way that, for values of said blocking-direction voltage equal to or greater than a first voltage value but equal to or smaller than a second voltage value, the magnitude of a main current increases with an increase in said blocking-direction voltage and, for values of said blocking-direction voltage equal to or greater than said second voltage value, said main current rises at a rate of increase greater than a rate of increase for values of said blocking-direction voltage equal to or greater than said first voltage value but equal to or smaller than said second voltage value.

11. A semiconductor device comprising a pair of main terminals wherein, for values of a blocking-direction voltage applied to said main terminals equal to or greater than a first voltage value but equal to or smaller than a second voltage value, the magnitude of a main current increases with an increase in said blocking-direction voltage and, for values of said blocking-direction voltage equal to or greater than said second voltage value, said main current rises at a rate of increase greater than a rate of increase for values of said blocking-direction voltage equal to or greater than said first voltage value but equal to or smaller than said second voltage

value.

12. A semiconductor device comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type
provided on said 1st semiconductor layer;

a 3rd semiconductor layer of the 1st conduction type
adjacent to said 2nd semiconductor layer;

a 4th semiconductor layer of the 2nd conduction type
adjacent to said 1st semiconductor layer;

a 5th semiconductor layer of the 1st conduction type
adjacent to said 1st and 4th semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd
and 3rd semiconductor layers;

a 2nd main electrode in ohmic contact with said 4th
and 5th semiconductor layers; and

an isolation gate electrode extending over said 1st,
2nd and 3rd semiconductor layers,

wherein a junction between said 1st and 4th
semiconductor layers exists at a location closer to a junction
between said 1st and 2nd semiconductor layers than a junction
between said 1st and 5th semiconductor layers does.

13. A semiconductor device comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type
provided on said 1st semiconductor layer;

a 3rd semiconductor layer of the 1st conduction type
adjacent to said 2nd semiconductor layer;

a 4th semiconductor layer of the 2nd conduction type
adjacent to said 1st semiconductor layer;

a 5th semiconductor layer of the 1st conduction type
adjacent to said 1st and 4th semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd
and 3rd semiconductor layers;

a 2nd main electrode in ohmic contact with said 4th
and 5th semiconductor layers; and

an isolation gate electrode extending over said 1st,
2nd and 3rd semiconductor layers,

wherein the number of impurities of the 1st
conduction type in a unit area on said 1st semiconductor layer
sandwiched by a junction between said 1st and 2nd semiconductor
layers and a junction between said 1st and 4th semiconductor
layers is equal to or smaller than $(\epsilon_m) \cdot (\epsilon_s) / q$ where symbol
 ϵ_m denotes the avalanche-breakdown electric field of a material
used for making said 1st semiconductor layer, symbol ϵ_s is the
dielectric constant of said material and q is the amount of

electric charge of an electron.

14. A semiconductor device comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type and
a 3rd semiconductor layer of the 2nd conduction type provided on
said 1st semiconductor layer;

a 4th semiconductor layer of the 1st conduction type
and a 5th semiconductor layer of the 1st conduction type
adjacent to said 2nd semiconductor layer;

a 6th semiconductor layer of the 1st conduction type
adjacent to said 3rd semiconductor layer;

a 7th semiconductor layer of the 2nd conduction type
adjacent to said 1st;

an 8th semiconductor layer of the 1st conduction type
adjacent to said 1st and 7th semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd
and 4th semiconductor layers;

a 2nd main electrode in ohmic contact with said 7th
and 8th semiconductor layers;

a 1st isolation gate electrode extending over said
2nd, 4th and 5th semiconductor layers; and

a 2nd isolation gate electrode extending over said
1st, 2nd and 3rd semiconductor layers;

wherein said 5th and 6th semiconductor layers are electrically connected to each other,

wherein a junction between said 1st and 7th semiconductor layers exists at a location closer to a junction between said 1st and 2nd semiconductor layers than a junction between said 1st and 8th semiconductor layers does.

15. A semiconductor device comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type

and a 3rd semiconductor layer of the 2nd conduction type provided on said 1st semiconductor layer;

a 4th semiconductor layer of the 1st conduction type and a 5th semiconductor layer of the 1st conduction type adjacent to said 2nd semiconductor layer;

a 6th semiconductor layer of the 1st conduction type adjacent to said 3rd semiconductor layer;

a 7th semiconductor layer of the 2nd conduction type adjacent to said 1st;

an 8th semiconductor layer of the 1st conduction type adjacent to said 1st and 7th semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd and 4th semiconductor layers;

a 2nd main electrode in ohmic contact with said 7th

and 8th semiconductor layers;

a 1st isolation gate electrode extending over said 2nd, 4th and 5th semiconductor layers; and

a 2nd isolation gate electrode extending over said 1st, 2nd and 3rd semiconductor layers,

wherein the number of impurities of the 1st conduction type in a unit area on said 1st semiconductor layer sandwiched by a junction between said 1st and 2nd semiconductor layers and a junction between said 1st and 7th semiconductor layers is equal to or smaller than $(\epsilon_m) \cdot (\epsilon_s) / q$ where symbol ϵ_m denotes the avalanche-breakdown electric field of a material used for making said 1st semiconductor layer, symbol ϵ_s is the dielectric constant of said material and q is the amount of electric charge of an electron.

16. A diode comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type provided on said 1st semiconductor layer;

a 3rd semiconductor layer of the 2nd conduction type adjacent to said 1st semiconductor layer;

a 4th semiconductor layer of the 1st conduction type adjacent to said 1st and 3rd semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd

semiconductor layer; and

a 2nd main electrode in ohmic contact with said 3rd and 4th semiconductor layers,

wherein a junction between said 1st and 3rd semiconductor layers exists at a location closer to a junction between said 1st and 2nd semiconductor layers than a junction between said 1st and 4th semiconductor layers does.

17. A diode comprising:

a 1st semiconductor layer of a 1st conduction type;

a 2nd semiconductor layer of a 2nd conduction type provided on said 1st semiconductor layer;

a 3rd semiconductor layer of the 2nd conduction type adjacent to said 1st semiconductor layer;

a 4th semiconductor layer of the 1st conduction type adjacent to said 1st and 3rd semiconductor layers;

a 1st main electrode in ohmic contact with said 2nd semiconductor layer; and

a 2nd main electrode in ohmic contact with said 3rd and 4th semiconductor layers,

wherein the number of impurities of the 1st conduction type in a unit area on said 1st semiconductor layer sandwiched by a junction between said 1st and 2nd semiconductor layers and a junction between said 1st and 3rd semiconductor

layers is equal to or smaller than $(\epsilon_m) \cdot (\epsilon_s) / q$ where symbol ϵ_m denotes the avalanche-breakdown electric field of a material used for making said 1st semiconductor layer, symbol ϵ_s is the dielectric constant of said material and q is the amount of electric charge of an electron.